

P A T E N T C L A I M S

- 1 1. A method for the bonding of disk-shaped substrates, the
2 substrates comprising an essentially plane disk-shaped
3 first substrate (11a) with a central opening (14a) and
4 with a first bonding surface (12a) and a back surface
5 (13a) opposite the first bonding surface (12a), and an
6 essentially plane disk-shaped second substrate (11b)
7 with a central opening (14b) and with a second bonding
8 surface (12b) to be bonded to the first bonding surface
9 (12a) by a layer of adhesive, the method comprising the
10 following steps:
11 - providing the first substrate (11a) and the second
12 substrate (11b),
13 - applying liquid adhesive to the first bonding
14 surface (12a) or the second bonding surface (12b) or
15 both,
16 - positioning, in a vacuum chamber, the first
17 substrate (11a) and the second substrate (11b) with the
18 second bonding surface (12b) facing the first bonding
19 surface (12a) at a distance,
20 - elastically deforming the first substrate (11a) in
21 such a way that the first bonding surface (12a) assumes
22 a bent shape and upholding the deformation by
23 mechanical means acting on the first substrate (11a),
24 - evacuating the vacuum chamber,
25 - moving the first substrate (11a) and the second
26 substrate (11b) towards each other and establishing a
27 small area of contact where edges of the first bonding
28 surface (12a) and the second bonding surface (12b)
29 touch,
30 - releasing the first substrate (11a) so as to allow
31 it to assume its unstressed essentially plane
32 configuration in such a way that the area of contact

33 spreads essentially to the entire first and second
34 bonding surfaces (12a, 12b) and
35 - raising the pressure in the vacuum chamber to
36 atmospheric pressure.

1 2. The method according to claim 1, **characterized in that**
2 the first substrate (11a) is deformed in such a way
3 that the first contact surface (12a) assumes a concave
4 or convex shape which is upheld by central mechanical
5 means acting on the first substrate (11a) in the
6 vicinity of the central opening (14a) of the same and
7 circumferential mechanical means acting on the first
8 substrate (11a) at positions offset towards the outer
9 edge of the said first substrate (11a).

1 3. The method according to claim 2, **characterized in that**
2 the central mechanical means exert on the first
3 substrate (11a) a force directed away from the second
4 substrate (11b) while the circumferential mechanical
5 means exert on the first substrate (11a) a force
6 directed towards the second substrate (11b), upholding
7 a deformation of the first substrate (11a) where the
8 shape of the first contact surface (12a) is concave.

1 4. The method according to claim 3, **characterized in**
2 **that** the central mechanical means comprise mechanical
3 stop means acting against the first bonding surface
4 (12a) and the circumferential mechanical means comprise
5 mechanical stop means acting on the back surface (13a)
6 of the first substrate (11a).

1 5. The method according to claim 3, **characterized in that,**
2 due to the elastic deformation of the first substrate
3 (11a), the area of the first bonding surface (12a)

4 adjacent the central opening (14a) is offset from a
5 plane intersecting the circumference of the first
6 bonding surface (12a) by between 1mm and 3mm.

1 6. The method according to claim 3, **characterized in that**
2 the area of contact is a narrow annulus adjacent to the
3 outer edge of the first bonding surface (12a) and the
4 second bonding surface (12b) or a subset thereof.

1 7. The method of claim 6, **characterized in that** the first
2 substrate (11a) is held in a slightly tilted position
3 with respect to the second substrate (11b) when contact
4 is established, thereby assuring that the area of
5 contact is at first restricted to a predefined sector
6 of the annulus.

1 8. The method according to claim 1, **characterized in that**
2 the vacuum chamber is evacuated to a pressure of
3 between 0.01mbar and 100mbar, preferably between
4 0.05mbar and 10mbar and in particular between 0.1mbar
5 and 2mbar.

1 9. The method according to claim 1, **characterized in that**
2 the liquid adhesive is spread over the first bonding
3 surface (12a), the second bonding surface (12b), or
4 both by spinning the first substrate (11a), the second
5 substrate (11b), or both, respectively.

1 10. An apparatus for carrying out a method of bonding disk-
2 shaped substrates comprising an essentially plane disk-
3 shaped first substrate (11a) with a central opening
4 (14a) and with a first bonding surface (12a) and a back
5 surface (13a) opposite the first bonding surface (12a),
6 and an essentially plane disk-shaped second substrate

7 (11b) with a central opening (14b) and with a second
8 bonding surface (12b) to be bonded to the first bonding
9 surface (12a) by a layer of adhesive, the apparatus
10 comprising a vacuum chamber accommodating:
11 - support means for supporting the first substrate
12 (11a), the support means being suitable as a
13 circumferential mechanical means for acting on the
14 first substrate (11a) at positions offset towards the
15 outer edge of the said substrate from its central
16 opening (14a),
17 - a holding device for holding the second substrate
18 (11b) in a position opposite the first substrate (11a)
19 with the second bonding surface (12b) facing the first
20 bonding surface (12a),
21 - a support pin (9) extendable through the central
22 openings (14a, 14b) of the first substrate (11a) and
23 the second substrate (11b), with radially extendable
24 and retractable central mechanical means for acting on
25 the edge of the central opening (14a) of the first
26 substrate (11a) or on the first bonding surface (12a)
27 in the vicinity of the central opening (14a).

1 11. The apparatus of claim 10, **characterized in that** the
2 vacuum chamber comprises a base plate (1) carrying the
3 support means and the support pin (9) and a cover (3)
4 carrying the holding device.

1 12. The apparatus of claim 10, **characterized in that** the
2 central mechanical means comprise mechanical stop means
3 for acting against the first bonding surface (12a) and
4 the circumferential mechanical means comprise
5 mechanical stop means for acting on the back surface
6 (13a) of the first substrate (11a).

- 1 13. The apparatus of claim 10, **characterized in that** the
2 support means is suitable for holding the first
3 substrate (11a) in a position where the first bonding
4 surface (12a) lies in an essentially horizontal first
5 plane and the holding device is suitable for holding
6 the second substrate (11b) in a position where the
7 second bonding surface (12b) lies in an essentially
8 horizontal second plane above the first plane.
- 1 14. The apparatus of claim 13, **characterized in that** the
2 first plane and the second plane are parallel.
- 1 15. The apparatus of claim 13, **characterized in that** the
2 first plane is slightly tilted with respect to the
3 second plane.
- 1 16. The apparatus of claim 15, **characterized in that** the
2 angle between the first plane and the second plane is
3 between 1° and 3°.
- 1 17. The apparatus of claim 10, **characterized in that** the
2 holding device is a suction holding device.
- 1 18. The method of claim 7, **characterized in that** the angle
2 between the plane of the first substrate and the plane
3 of the second substrate is at least 1° and not greater
4 than 3°.